

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
KEVIN J. DUNLEAVY  
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PHILADELPHIA, PENNSYLVANIA 19103

## PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION

(PCI Rule 44.1)

Applicant's or agent's file reference DREX-1005WO	Date of mailing (day/month/year) <b>26 MAY 2005</b>
International application No PCT/US04/36705	International filing date (day/month/year) 27 October 2004 (27.10.2004)
Applicant DREXEL UNIVERSITY	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.  
  
**Filing of amendments and statement under Article 19:**  
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):  
  

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report  
  
**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 740 14 35  
  
**For more detailed instructions,** see the notes on the accompanying sheet
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith
3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40 2, the applicant is notified that:
 

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices  
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made

### 4 Reminders

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis 1 and 90bis 3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

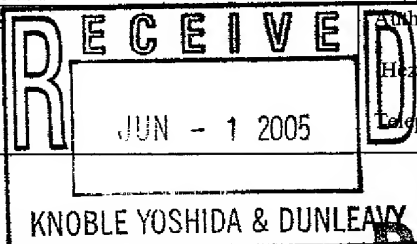
Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Hezron Williams Telephone No. (571) 272-1111 
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Form PCT/ISA/220 (January 2004)

(See notes on accompanying sheet)



## DOCKETED

cm

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference DREX-100SWO	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No PCT/US04/36705	International filing date ( <i>day/month/year</i> ) 27 October 2004 (27.10.2004)	(Earliest) Priority Date ( <i>day/month/year</i> ) 27 October 2003 (27.10.2003)
Applicant DREXEL UNIVERSITY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.



It is also accompanied by a copy of each prior art document cited in this report

#### 1. Basis of the Report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐

contained in the international application in written form

☐

filed together with the international application in computer readable form

☐

furnished subsequently to this Authority in written form.

☐

furnished subsequently to this Authority in computer readable form

☐

the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished

☐

the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (See Box II)

4. With regard to the **title**,

☒

the text is approved as submitted by the applicant

☐

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐

the text is approved as submitted by the applicant

☒

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 2

☐

as suggested by the applicant.

☐

None of the figures

☐

because the applicant failed to suggest a figure.

☒

because this figure better characterizes the invention.

# INTERNATIONAL SEARCH REPORT

International application No

PCI/US04/36705

## Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

### NEW ABSTRACT

A piezoelectric cantilever with a non-piezoelectric, or piezoelectric tip useful as mass and viscosity sensors. The change in the cantilever mass can be accurately quantified by monitoring a resonance frequency shift of the cantilever. For bio-detection, antibodies or other specific receptors of target antigens may be immobilized on the cantilever surface, preferably on the non-piezoelectric tip. For chemical detection, high surface-area selective absorbent materials are coated on the cantilever tip. Binding of the target antigens or analytes to the cantilever surface increases the cantilever mass. Detection of target antigens or analytes is achieved by monitoring the cantilever's resonance frequency and determining the resonance frequency shift that is due to the mass of the adsorbed target antigens on the cantilever surface. The use of a piezoelectric unimorph cantilever allows both electrical actuation and electrical sensing. Incorporating a non-piezoelectric tip (14) enhances the sensitivity of the sensor. In addition, the piezoelectric cantilever can withstand damping in highly viscous liquids and can be used as a viscosity sensor in wide viscosity range.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/36705

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01N 1/00  
US CL : 73/864 81

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 73/864.81

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,252,335 B1 (NILSSON et al) 26 June 2001 (26.06.2001), columns 1-4.	1-45
A	US 5,162,691 A (MARIANI et al) 10 November 1992 (10.11.1992), columns 1-4.	1-45

☐ Further documents are listed in the continuation of Box C

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure use exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

06 March 2005 (06.03.2005)

Date of mailing of the international search report

26 MAY 2005

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner of Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Authorized officer

Hezron E Williams

Telephone No (571) 272-1111

Facsimile No. (703) 305-3230

*Hezron E Williams*

# INTERNATIONAL SEARCH REPORT

PCT/US04/36705

## Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: piezoelectric, layer, film, coat, ratio, thickness, electrode, probe, sensor

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis 1)

To:  
KEVIN J. CUNLEAVY  
KNOBLE YOSHIDA & DUNLEAVY, LLC  
EIGHT PENN CENTER, SUITE 1350  
1628 JOHN F. KENNEDY BLVD.  
PHILADELPHIA, PENNSYLVANIA 19103

Date of mailing  
(day/month/year) **26 MAY 2005**

Applicant's or agent's file reference

**FOR FURTHER ACTION**

See paragraph 2 below

DREX-100SWO

International application No.

International filing date (day/month/year)

Priority date (day/month/year)

PCI/US04/36705

27 October 2004 (27.10.2004)

27 October 2003 (27.10.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): G01N 1/00 and US Cl.: 73/864.81

Applicant

DREXEL UNIVERSITY

1 This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis 1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2 FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66 1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCI/ISA/220.

3 For further details, see notes to Form PCI/ISA/220.

Name and mailing address of the ISA/ US

Mail Stop PCI, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

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Authorized officer

Hezron E Williams

Telephone No (571) 272-1111



WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US04/36705

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item

☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b))

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No  
PCT/US04/36705

**Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims 1-45	YES
	Claims NONE	NO
Inventive step (IS)	Claims 1-45	YES
	Claims NONE	NO
Industrial applicability (IA)	Claims 1-45	YES
	Claims NONE	NO

2. Citations and explanations:

Claims 1-45 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest an apparatus for sensing mass comprising a piezoelectric layer bonded to a non piezoelectric layer, wherein a length of one of said piezoelectric layer and said non piezoelectric layer is less than a length of another of said piezoelectric layer and non piezoelectric layer, wherein a ratio of a thickness of said non piezoelectric layer to a thickness of said piezoelectric layer is from about .1 to 3.

Claims 1-45 meet the criteria set out in PCT Article 33(4), because the claimed subject matter is useful in the industry